PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

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PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing (*day/month/year*)	10 MAY 2005
Applicant's or agent's file reference 6740-0075WO	FOR FURTHER ACTION See paragraph 2 below

International application No.	International filing date (*day/month/year*)	Priority date (*day/month/year*)
PCT/US05/01985	20 January 2005 (20.01.2005)	22 January 2004 (22.01.2004)

International Patent Classification (IPC) or both national classification and IPC

IPC(7): H01M 8/00, 02 and US Cl.: 429/34-36

Applicant

HENKEL CORPORATION

1. This opinion contains indications relating to the following items:

- [X] Box No. I — Basis of the opinion
- [ ] Box No. II — Priority
- [ ] Box No. III — Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- [ ] Box No. IV — Lack of unity of invention
- [X] Box No. V — Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- [ ] Box No. VI — Certain documents cited
- [ ] Box No. VII — Certain defects in the international application
- [ ] Box No. VIII — Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(*b*) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ US	Authorized officer
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230	Gregg Cantelmo Telephone No. 571-272-1283

Form PCT/ISA/237 (cover sheet) (January 2004)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US05/01985

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material

      ☐ a sequence listing

      ☐ table(s) related to the sequence listing

   b. format of material

      ☐ in written format

      ☐ in computer readable form

   c. time of filing/furnishing

      ☐ contained in international application as filed.

      ☐ filed together with the international application in computer readable form.

      ☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
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Box No. V Reasoned statement under Rule 43 *bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1-28	YES
	Claims NONE	NO
Inventive step (IS)	Claims NONE	YES
	Claims 1-28	NO
Industrial applicability (IA)	Claims 1-28	YES
	Claims NONE	NO

2. Citations and explanations:

Please See Continuation Sheet

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US05/01985

Supplemental Box
In case the space in any of the preceding boxes is not sufficient.

V. 2. Citations and Explanations:

Claims 1-12, 17, and 21-28 lack an inventive step under PCT Article 33(3) as being obvious over U.S. patent No. 6,080,503 (Schmid) in view of U.S. patent Application Publication No. 2003/0199652 (Deviny).

Schmid discloses an electrochemical cell and method of making the cell comprising a first electrochemical cell component 11, a second electrochemical cell component 12 and a methacrylate sealant 50 disposed between the two components (see Figs. 3a and 5a as applied to claims 1, 21 and 22).

Components 11 and 12 can be electrically conductive plastic (col. 1, ll. 34-41 as applied to claims 2-6).

The adhesive can be bonded to both cell components as shown in Figs. 3a and 5a or can be bonded to only one of the surfaces as shown in Fig. 3d as applied to claims 7 and 8).

Components 11 and 12 are flow field plates (Figs. 3a and 5a as applied to claims 9-10, 23 and 24).

The electrochemical cell is a fuel cell (col. 1, ll. 6-11 as applied to claims 20 and 28).

The differences between the instant claims and Schmid are that Schmid does not disclose providing a boron-containing initiator or of the specifics of the initiator and the methacrylate adhesive.

Deviny is drawn to methacrylate adhesives wherein a boron-containing initiator is provided to photocure the methacrylate adhesive. The sealant comprises both a methacrylate and a boron initiator (paragraphs [0040]-[0041] as applied to claims 1, 21 and 22).

The sealant of Deviny is can be either a mono-functional or poly-functional decomplexer (paragraph [0017] as applied to claims 11 and 25).

The polymerizable mononmer includes methyl(meth)acrylate (paragraph [0086] as applied to claims 12 and 26).

The boron initiator is an organoborane amine complex in combination with a poly-functional aziridine (paragraph [0080]-[0081] as applied to claims 17 and 27).

The motivation for using the combined methacrylate and boron initiator of Deviny is that it would have provided a sufficient means for curing and setting the adhesive resin between the flow plates of Schmid and thus effectively sealed the fuel cell as desired by Schmid.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Schmid by using the combined methacrylate and boron initiator of Deviny is that it would have provided a sufficient means for curing and setting the adhesive resin between the flow plates of Schmid and thus effectively sealed the fuel cell as desired by Schmid. Further one of ordinary skill in the art of using methacrylate sealants would have found the combination of a methacrylate with a boron initiator to have been an obvious combination for curing and setting the methacrylate adhesive and selection of any combination of materials for such purpose would have been readily apparent to one of ordinary skill in cured methacrylate adhesives.

Claims 13 and 26 lack an inventive step under PCT Article 33(3) as being obvious over the prior art as applied to claims 1, 21 and 22 discussed above and further in view of WO 01/43960 (WO '960).

The teachings of claims 1, 21 and 22 have been discussed above and are incorporated herein.

The differences not yet discussed are of the polyfunctional (meth)acrylate.

Desirably, the sealant has a polymerizable component with a majority of

Supplemental Box
In case the space in any of the preceding boxes is not sufficient.

polyfunctional (meth)acrylate esters (hereinafter, poly(meth)acrylate esters). These polyfunctional esters produce cross-linked polymers, which serve as effective and durable sealants, adhesives and coatings. While various (meth)acrylate esters may be used, desirable poly(meth)acrylate esters are shown on pages 13-15 of WO '960.

Use of polyfunctional (meth)acrylates provide cross-linking which serve as effective and durable sealants and adhesives.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Schmid by using the

Claims 14-16 lack an inventive step under PCT Article 33(3) as being obvious over the prior art as applied to claim 1 discussed above and further in view of EP 1201722 A1 (EP '722).

The teachings of claim 1 have been discussed above and are incorporated herein.

The differences not yet discussed are of the boron-containing initiator being an alkyl-borohydride as defined in claims 14-16.

EP '722 discloses that the use of alkyl borohydrides as defined in claims 14-16 are known polymerizing initiators in adhesive methacrylate compositions (abstract and paragraph [0030]).

The use of this initiator in methacrylate adhesives is shown to improve the bonding strength of the adhesive.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Schmid by using the alkyl borohydride initiator of EP '722 since it would have improved the bonding strength of the adhesive.

Claim 18 lacks an inventive step under PCT Article 33(3) as being obvious over the prior art as applied to claim 1 discussed above and further in view of U.S. patent Application Publication No. 2004/0010099 (Kneafsey)

The teachings of claim 1 have been discussed above and are incorporated herein.

The differences not yet discussed are of the boron-containing initiator being an organoborane in combination with a polyfunctional aziridine as defined in claims 18.

Kneafsey discloses using an organoborane/polyaziridine complex initiator for adhesives which have the same structure as that defined in claim 18 (see abstract).

The use of this initiator in methacrylate adhesives is shown to improve the shearing and bonding strength of the adhesive.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Schmid by using the alkyl borohydride initiator of Kneafsey since it would have improved the shearing and bonding strength of the adhesive.

Claim 19 lacks an inventive step under PCT Article 33(3) as being obvious over the prior art as applied to claim 1 discussed above and further in view of U.S. patent No. 6,803.330 (Sonnenschein).

The teachings of claim 1 have been discussed above and are incorporated herein.

The differences not yet discussed are of the boron-containing initiator being an that as defined in claim 19.

Sonnenschein discloses that the use of trialkyl boranes or alkyl cycloalkyl boranes and an amine as defined in claims 19 are known polymerizing initiators in adhesive methacrylate compositions (abstract and col. 4, ll. 4 through col. 8, ll. 67).

The use of this initiator in methacrylate adhesives is shown to improve the bonding strength of the adhesive.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Schmid by using the alkyl borohydride initiator of Sonnenschein since it would have improved the bonding strength of the adhesive.

Claims 1-28 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.